

Acarologia

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Subscriptions: Year 2021 (Volume 61): 450 €

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Previous volumes (2010-2020): 250 € / year (4 issues)

Acarologia, CBGP, CS 30016, 34988 MONTFERRIER-sur-LEZ Cedex, France

ISSN 0044-586X (print), ISSN 2107-7207 (electronic)

The digitalization of Acarologia papers prior to 2000 was supported by Agropolis Fondation under the reference ID 1500-024 through the « Investissements d'avenir » programme (Labex Agro: ANR-10-LABX-0001-01)



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TWO NEW SPECIES OF THE FAMILY GALUMNELLIDAE (ACARI: ORIBATIDA) FROM INDIA

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(Received 12 April 2012; accepted 23 January 2013; published online 30 September 2013)

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ABSTRACT — Two new galumnellid mites, *Galumnella parageographica* **n. sp.** and *Porogalumnella microsetosa* **n. sp.**, are described from Indian soils. *Galumnella parageographica* **n. sp.** is morphologically most similar to *G. geographica* Mahunka, 1995 from Malaysia, from which it differs by tuberculated pteromorphs, the presence of a median pore on the notogaster and monodactylous legs. *Porogalumnella microsetosa* **n. sp.** is morphologically most similar to *P. reducta* Mahunka, 1995 from Malaysia, from which it differs by the presence of polygonal ornamentation in the anogenital region and nearly smooth sensilli. An identification key to the known species of *Porogalumnella* is provided.

KEYWORDS — oribatid mites; new species; Galumnellidae; *Galumnella*; *Porogalumnella*; key; India

INTRODUCTION

During taxonomic identification of oribatid mites (Acari: Oribatida) from India, we found two new species of the family Galumnellidae, one belonging to the genus *Galumnella* Berlese, 1916, the other to *Porogalumnella* Balogh, 1968. In this paper the new species are described and illustrated under the names *Galumnella parageographica* **n. sp.** and *Porogalumnella microsetosa* **n. sp.**

The genus *Galumnella* was proposed by Berlese (1916) with *Galumnella paradoxa* Berlese, 1916 as the type species. Currently, it comprises more than 20 species, which are collectively distributed in the tropic regions. The main characters of *Galumnella* are (summarized by Balogh and Balogh 2002; Ermilov and Anichkin 2011; including our additions and corrections): body surface with ornamentation (foveolate, reticulate, punctate, granulate); lamel-

lar and sublamellar lines present (rarely sublamellar lines absent); sensilli long, setiform or with slightly dilated, pointed head, directed backwards; notogaster without porose areas (sometimes with pores); notogastral setae represented by 10 short setae or their alveoli; epimeral neotrichy absent; leg tarsi with one or three claws. Identification keys for the many known species of this genus were presented by Balogh and Balogh (2002) and Ermilov and Anichkin (2011).

The genus *Porogalumnella* was proposed by Balogh (1968) with *Porogalumnella quadriporosa* Balogh, 1968 as the type species. Currently, it comprises five species, which are collectively distributed in the tropic regions. The main characters of *Porogalumnella* are (summarized by Balakrishnan and Haq 1982; Balogh and Balogh 1992; including our additions and corrections): body

surface with ornamentation (foveolate, reticulate, punctate, granulate); lamellar and sublamellar lines present; sensilli long or of medium size, with dilated, pointed head, directed backwards; notogaster with porose areas; notogastral setae represented by 10 short or long setae or their alveoli; epimeral neutrichy absent; leg tarsi with one or two claws. Below, we provide the first identification key to known species of this genus.

MATERIALS AND METHODS

Specimens of both new species were collected at the same locality: India, Arunachal Pradesh, Hunli vicinity, 28°19'32"N, 95°57'31"E, 1300 m a.s.l. They were extracted from soil by L. Dembický and O. Šauša on 01.VI.2012. *Galumnella parageographica* n. sp. is represented by the holotype (female) and one paratype (female); *Porogalumnella microsetosa* n. sp. is represented by the holotype (female) and four paratypes (three females, one male). The specimens were mounted in lactic acid on temporary cavity slides for measurement and illustration. All body measurements are presented in micrometers. The body length was measured in lateral view, from the tip of the rostrum to the posterior edge of the ventral plate. The notogastral width refers to the maximum width in dorsal aspect. Lengths of body setae were measured in lateral aspect. Formulae for leg setation are given in parentheses according to the sequence trochanter-femur-genu-tibia-tarsus (famulus included). Formulae for leg solenidia are given in square brackets according to the sequence genu-tibia-tarsus. General terminology used in this paper follows that of F. Grandjean (summarized by Norton and Behan-Pelletier 2009).

DESCRIPTIONS OF NEW SPECIES

Galumnella parageographica n. sp. (Figure 1)

Diagnosis — Body size 381 – 398 × 265 – 282. All surface of prodorsum, notogaster and anogenital region with polygonal ornamentation. Pteromorphs only with tubercles. Rostrum triangular, narrowly rounded distally. Rostral, lamellar, notogastral, epimeral and anogenital setae short, thin,

smooth. Sensilli long, setiform, ciliate. Notogaster with median pore and one pair of dorso-lateral pores. Three genital setae aligned along anterior margin of each plate. Postanal porose area small, rounded. Leg tarsi with one claw.

Description — Measurements. Body length: 381 (holotype), 398 (one paratype); notogaster width: 265 (holotype), 282 (paratype). *Integument* (Figure 1A, B, C, E). Body color dark-brown. Surface of body and pteromorphs microfoveolate (well visible under high magnification). Surface of prodorsum, notogaster and anogenital region with polygonal ornamentation. Pteromorphs and anterior part of notogaster with tubercles (diameter up to 6). Genital plates with indistinct longitudinal lines.

Prodorsum — (Figure 1A, C, D). Rostrum triangular, narrowly rounded distally. Lamellar (*L*) and sublamellar (*S*) lines well developed, parallel in proximal half, weakly divergent in distal half. Rostral (*ro*, 6) and lamellar (*le*, 4) setae thin, smooth. Interlamellar setae (*in*) represented only by alveoli. Sensilli long (*ss*, 98 – 102), setiform, thickened, indistinctly dilated in medial part, with numerous cilia on dorsal side. Exobothridial setae and porose areas *Ad* not evident.

Notogaster — (Figure 1A, C, E). Anterior notogastral margin complete, slightly convex. Nine pairs of notogastral setae present, short (4), thin, smooth; setae *c* represented by alveoli. Median pore (*mp*) present, located between setal pair *lm*. One pair of small pores (*P*, diameter 4) present dorso-laterally. Lyrifissures *ia* not observed on pteromorphs, other lyrifissures (*im*, *ip*, *ih*, *ips*) distinct.

Gnathosoma — Morphology typical for *Galumnella* (see Engelbrecht 1972; Ermilov and Anichkin 2011).

Epimeral and lateral podosomal regions — (Figure 1B). Epimeral setal formula: 1-0-3-3. Five pairs of epimeral setae short (4), thin, smooth; setae *3c* and *4c* longer (8), visible in lateral view.

Anogenital region — (Figure 1B). Six pairs of genital setae present: three aligned on anterior margin, longer (6) than the other three (4). One pair of aggenital (*ag*), three pairs of adanal (*ad*₁-*ad*₃) and two pairs of anal (*an*₁, *an*₂) setae short (4), thin,

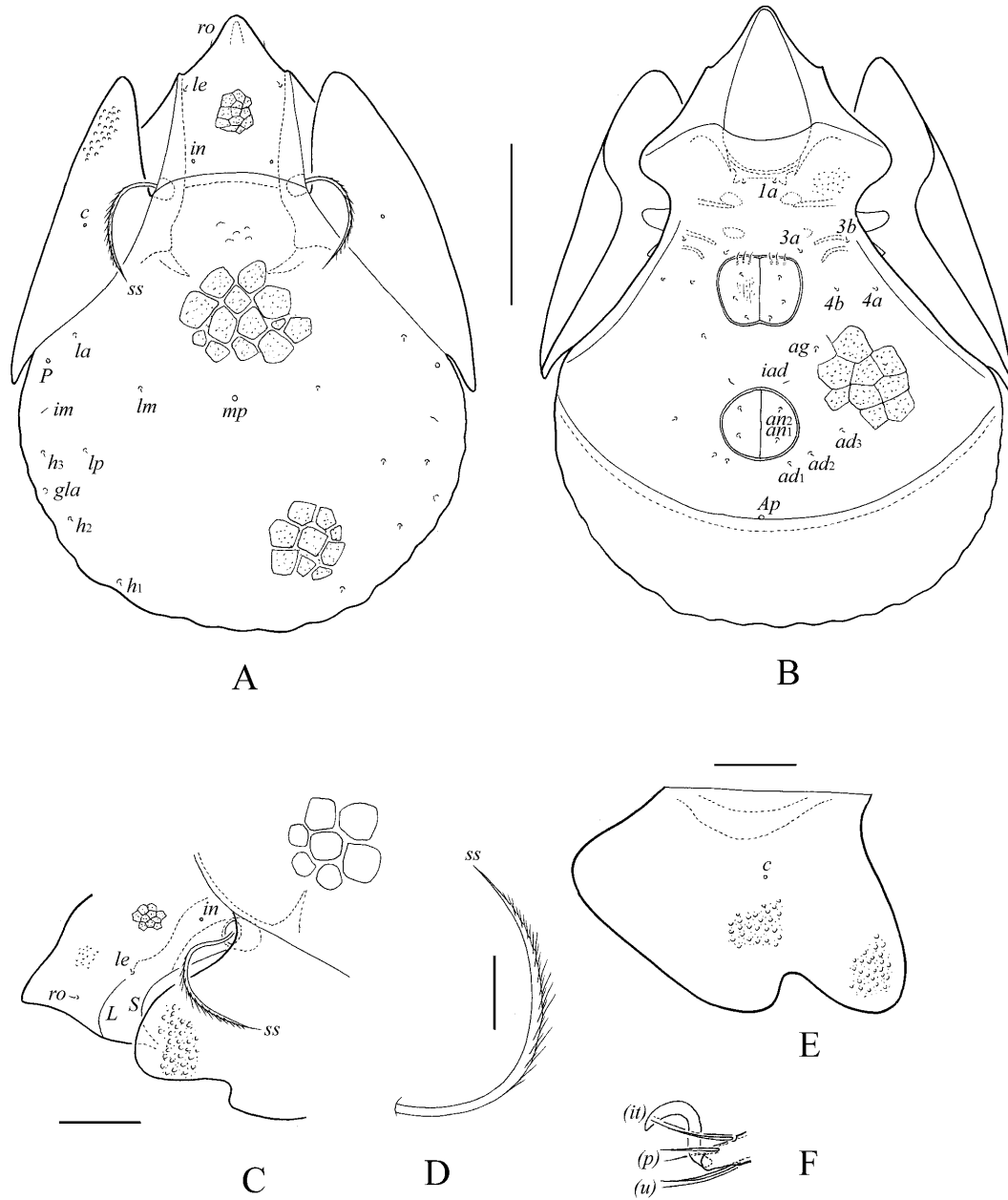


FIGURE 1: *Galumnella paraeographica* n. sp.: A – dorsal view; B – ventral view (gnathosoma and legs not illustrated); C – dorso-lateral view of anterior half; D – sensillus; E - pteromorph; F – anterior part of right tarsus III, antiaxial view. Scale bar (A+B) 100 μ m, scale bar (C, E) 50 μ m, scale bar (D) 20 μ m, scale bar (F) 10 μ m.

smooth. Lyrifissures *iad* located in preanal position. Postanal porose area (*Ap*) small (4), rounded.

Legs — (Figure 1F). Morphology typical for *Galumnella* (see Engelbrecht 1972; Ermilov and Anichkin 2011). Leg tarsi with one smooth claw. Formulae of leg setation and solenidia: I (1-4-3-4-20) [1-2-2], II (1-4-3-4-15) [1-1-2], III (1-2-1-3-15) [1-1-0], IV (1-2-2-3-12) [0-1-0]; homology of setae and solenidia indicated in Table 1.

Type deposition — The holotype is deposited in the collection of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia; the paratype is in the personal collection of the first author.

Etymology — The prefix *para* is Latin meaning "near" and refers the similarity between the new species and the species *Galumnella geographica* Mahunka, 1995.

Remarks — *Galumnella parageographica* n. sp. is similar to *G. geographica* Mahunka, 1995 from Malaysia (see Mahunka 1995) in having setiform, barbed sensilli and polygonal ornamentation on the prodorsum, notogaster and anogenital region. However, it differs clearly from the latter by the having tubercles on the pteromorphs and a median notogastral pore (neither present in *G. geographica*) and monodactylous legs (tridactylous in *G. geographica*).

Porogalumnella microsetosa n. sp. (Figure 2)

Diagnosis — Body size 348 – 381 × 265 – 298. Surface of prodorsum and notogaster with large foveolae. Surface of anogenital region with polygonal ornamentation. Rostrum triangular, narrowly rounded distally. Rostral, lamellar, notogastral, epimeral and anogenital setae short, thin, smooth. Sensilli long, with asymmetrically dilated, pointed head; smooth or with subterminal tooth. Notogaster with two pairs of small porose areas. Each genital plate with three setae along anterior margin. Postanal porose area oval. Leg tarsi with one claw.

Description — Measurements. Body length: 381 (holotype), 348 – 381 (mean 356; four paratypes); 298 (holotype), 265 – 298 (mean 282; four paratypes).

Integument — (Figure 2A, B, C, E). Body color dark-brown. Surface of prodorsum and notogaster with large round foveolae (diameter up to 8). Surface of anogenital region with polygonal ornamentation. Pteromorphs with polygonal foveolae. Genital plates with indistinct longitudinal lines.

Prodorsum — (Figure 2A, C, D). Rostrum triangular, narrowly rounded distally. Lamellar and sublamar lines well developed, parallel. Rostral (12 – 16) and lamellar (6 – 8) setae thin, smooth. Interlamellar setae vestigial. Sensilli long (98 – 106), with asymmetrically dilated, pointed head; smooth or with subterminal tooth. Exobothridial setae and porose areas *Ad* not evident.

Notogaster — (Figure 2A, C, E). Anterior notogastral margin complete, slightly convex. Nine pairs of notogastral setae present, short (4), thin, smooth; setae *c* represented by alveoli. Two pairs of porose areas rounded (*Aa*, *A1*, 4 – 8). Median pore and dorso-lateral pores absent. Lyrifissures *ia* not observed on pteromorphs, other lyrifissures (*im*, *ip*, *ih*, *ips*) distinct.

Gnathosoma — Morphology typical for *Porogalumnella* (see Balakrishnan and Haq 1982).

Epimeral and lateral podosomal regions — (Figure 2B). Epimeral setal formula: 1-0-3-3. Setae *1a*, *3a*, *4a*, *4b* shorter (4) than *3b*, *3c*, *4c* (8).

Anogenital region — (Figure 2B). Six pairs of genital setae present, of which anterior three aligned on anterior margin, longer (6) than the other three (4). One pair of aggenital, three pairs of adanal and two pairs of anal setae short (4), thin, smooth. Lyrifissures *iad* located in preanal position. Postanal porose area oval (8 – 12 × 4 – 6).

Legs — (Figure 2F). Morphology typical for *Porogalumnella* (see Balakrishnan and Haq 1982), but all leg tarsi with one smooth claw. Formulae of leg setation and solenidia: I (1-4-3-4-20) [1-2-2], II (1-4-3-4-15) [1-1-2], III (1-2-1-3-15) [1-1-0], IV (1-2-2-3-12) [0-1-0]; homology of setae and solenidia indicated in Table 1.

Type deposition — The holotype is deposited in the collection of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia; two paratype are deposited in the collection of the

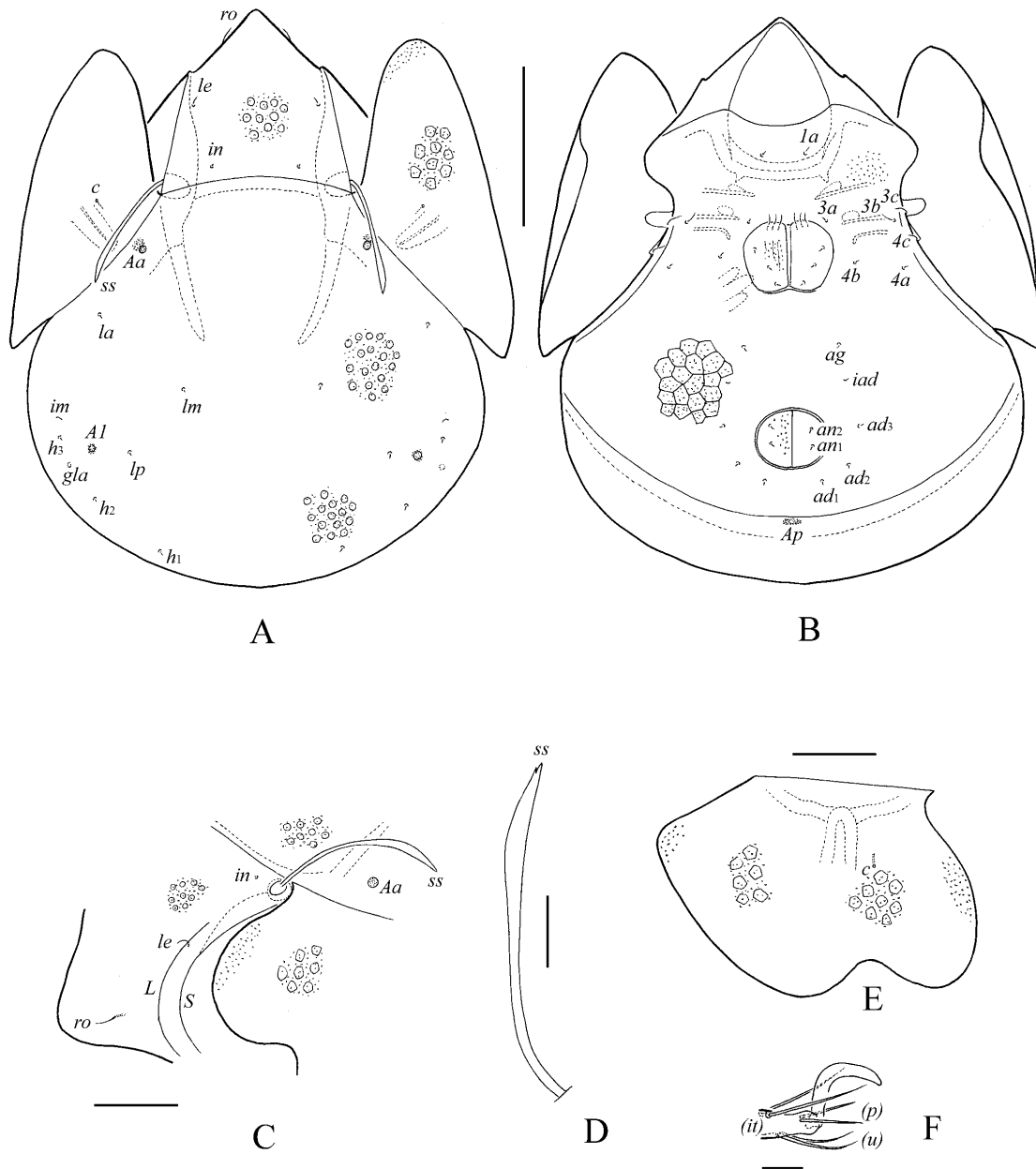


FIGURE 2: *Porogalumnella microsetosa* n. sp.: A – dorsal view; B – ventral view (gnathosoma and legs not illustrated); C – dorso-lateral view of anterior half; D – sensillus; E – pteromorph; F – anterior part of left tarsus I, paraxial view. Scale bar (A+B) 100 μ m, scale bar (C, E) 50 μ m, scale bar (D) 20 μ m, scale bar (F) 10 μ m.

TABLE 1: Leg setation and solenidia of *Galumnella parageographica* n. sp. and *Porogalumnella microsetosa* n. sp.

Leg	Trochanter	Femur	Genu	Tibia	Tarsus
I	<i>v'</i>	<i>d, (l), bv''</i>	<i>(l), v', σ</i>	<i>(l), (v), φ₁, φ₂</i>	<i>(ft), (tc), (it), (p), (u), (a), s, (pv), v', (pl), l'', e, ω₁, ω₂</i>
II	<i>v'</i>	<i>d, (l), bv''</i>	<i>(l), v', σ</i>	<i>(l), (v), φ</i>	<i>(ft), (tc), (it), (p), (u), (a), s, (pv), ω₁, ω₂</i>
III	<i>v'</i>	<i>d, ev'</i>	<i>l', σ</i>	<i>l', (v), φ</i>	<i>(ft), (tc), (it), (p), (u), (a), s, (pv)</i>
IV	<i>v'</i>	<i>d, ev'</i>	<i>d, l'</i>	<i>l', (v), φ</i>	<i>ft'', (tc), (p), (u), (a), s, (pv)</i>

Roman letters refer to normal setae (*e* to famulus), Greek letters to solenidia. Single prime (') marks setae on anterior and double prime (") setae on posterior side of the given leg segment. Parentheses refer to a pseudo-symmetrical of setae.

Siberian Zoological Museum, Novosibirsk, Russia; two paratypes are in the personal collection of the first author.

Etymology — The specific name "*microsetosa*" refers to the very short notogastral setae.

Remarks — *Porogalumnella microsetosa* n. sp. is similar to *P. reducta* Mahunka, 1995 from Malaysia (see Mahunka 1995) in having large foveolae on the notogaster. It differs clearly from the latter by the presence of polygonal ornamentation in the anogenital region (with large foveolae in *P. reducta*) and the sensilli being smooth or with one tooth (densely barbed in *P. reducta*). Characters distinguishing the new species from other species of *Porogalumnella* can be found in the identification key below.

Key to known species *Porogalumnella*

1. Anterior part of prodorsum with median longitudinal ridge, anterior part of notogaster with median longitudinal groove; notogastral setae well developed, setiform; body size: 410 – 422 × 320 – 344. *Porogalumnella setosa* Balakrishnan and Haq, 1982 (Distribution: India) — Anterior part of prodorsum without median longitudinal ridge, anterior part of notogaster without median longitudinal groove; notogastral setae minute or represented by alveoli 2
2. Anogenital surface with polygonal ornamentation 3 — Anogenital surface without polygonal ornamentation 5
3. Prodorsum and notogaster with large foveolae; sensilli smooth or with one tooth; body size: 348 –

381 × 265 – 298. *Porogalumnella microsetosa* n. sp. (Distribution: India)

— Prodorsum without large foveolae, notogaster with polygonal ornamentation; sensilli densely barbed 4

4. Prodorsum and pteromorphs with polygonal ornamentation; rostrum with conical protrusion; body size: 302 – 355 × 242 – 288

..... *Porogalumnella pulchella* Aoki and Hu, 1993 (Distribution: China)

— Prodorsum and pteromorphs with microgranules; rostrum without conical protrusion

..... *Porogalumnella quadriporosa* Balogh, 1968 (Distribution: New Guinea)

5. Notogaster and anogenital region with large foveolae; sensillar head densely barbed

..... *Porogalumnella reducta* Mahunka, 1995 (Distribution: Malaysia)

— Notogaster and anogenital region punctate and with short striae; sensillar head with only several cilia *Porogalumnella africana* Mahunka, 1978 (Distribution: Mauritius)

ACKNOWLEDGEMENTS


We cordially thank four anonymous reviewers for their valuable comments. We gratefully acknowledge L. Dembický and O. Šauša for help in obtaining specimens.

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